Claims

1. Method for reducing echo signals in telecommunications systems for the transmission of wanted acoustic signals, particularly human speech, in which the presence of echo signals is detected and/or predicted and the detected and/or predicted echo signals are subsequently suppressed or reduced,

characterized in that

the power value of the noise level N in the currently used telecommunications channel is continuously measured and/or estimated, and that the degree of reduction of the echo signals to be currently effected is set continuously and automatically, in dependence on the current noise level N, according to a predefined function h(N).

2. Method according to Claim 1, characterized in that the function h(N) increases as N increases, whereby $h(N \ll 0\ dB_m) = h_{min} = \text{const.}$ and $h(N \approx 0\ dB_m) = h_{max} > h_{min}$.

3. Method according to Claim 2, characterized in that:

$-50\ dB < h_{min} < -20\ dB$, preferably $-45\ dB \leq h_{min} \leq -35\ dB$ and

$-20\ dB < h_{max} < 0\ dB$, preferably $-12\ dB \leq h_{max} \leq -6\ dB$.

4. Method according to Claim 1, characterized in that the predefined function h(N) is a function k(S/N) which

depends on the signal-to-noise ratio, i.e., the quotient S/N from the power value of the signal level S of the wanted signals to be transmitted and the power value of the noise level N, or that the predefined function h(N) is a function k'(N/S) which depends on the reciprocal N/S of this quotient, preferably on N/(N+S).

5. Method according to Claim 1, characterized in that, in addition to the recognition and reduction of echo signals, noise signals are also suppressed or reduced.

6. Method according to Claim 5, characterized in that the degree of reduction of the noise level N to be currently effected is set continuously and automatically, in dependence on the current noise level N, according to a predefined function f(N) or g(S/N) or g'(N/S), preferably g'(N/[N+S]).

7. Method according to Claim 6, characterized in that, for $N << 0\ dB_m$, the functions f(N), g(S/N), g'(N/S) or g'([N/N+S]) each begin, respectively, with a constant maximum value f_{max} or g_{max} or $g'_{max} \approx 0$, fall to, in particular, a settable value, preferably a minimum value f_{min} or g_{min} or g'_{min} respectively in the range between $N = -15\ dB_m$ to $-10\ dB_m$, preferably for N or S/N $\approx -12\ dB_m$, and then rise, to $N \approx 0\ dB_m$, to a constant value $f_0 > f_{min}$ or $g_0 > g_{min}$ or $g'_0 > g'_{min}$, wherein f_0, g_0, $g'_0 < 0$.

8. Method according to Claim 7, characterized in that:

$f_0 \leq -5$ dB, $g_0 \geq -10$ dB, preferably $f_0 \leq -6$ dB, $g_0 \geq -8$ dB, and

$f_{min} \leq -20$ dB, $g_{min} \geq -30$ dB, preferably f_{min}, $g_{min} \approx -25$ dB.

9. Method according to Claim 1, characterized in that the function h(N), at least partially, and preferably in all sub-sections, runs linearly with N.

10. Method according to Claim 4, characterized in the functions k(S/N) and k'(N/S), at least partially, and preferably in all sub-sections, run linearly with S/N and N/S or N/(N+S) respectively.

11. Method according to Claim 1, characterized in that the function h(N) is constructed of polynomials and runs over N as an asymmetric bell-shaped curve.

12. Method according to Claim 4, characterized in that the functions k(S/N) and k'(N/S) are constructed of polynomials and run over S/N and N/S respectively as asymmetric bell-shaped curves.

13. Method according to Claim 1, characterized in that the function k(N) is selected so that the reduction of the noise level N is auditorially adapted according to the psychoacoustic mean values of the human auditory spectrum.

14. Method according to Claim 4, characterized in that the functions k(S/N) and k'(N/S) are each respectively selected so that the reduction of the noise level N is

auditorially adapted according to the psychoacoustic mean values of the human auditory spectrum.

15. Method according to Claim 1, characterized in that a speech pause detector (SPD) is used for recognition of the noise level N.

16. Method according to Claim 15, characterized in that the power value of the signal to be transmitted is reduced during the speech pauses according to an exponential function.

17. Method according to Claim 5, characterized in that the reduction of noise signals and the reduction of echo signals are controlled separately.

18. Method according to Claim 1, characterized in that an artificial noise signal is also added to the wanted signal during an echo reduction period.

19. Method according to Claim 18, characterized in that the artificial noise signal comprises a signal sequence which is perceived psychoacoustically as an acoustically comfortable noise (= comfort noise).

20. Method according to Claim 18, characterized in that the artificial noise signal comprises a noise signal recorded previously during the current telecommunications connection.